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17th November 2006

Dr John Tamblyn
Chairman
Australian Energy Market Commission
Level 16
1 Margaret Street
Sydney NSW 200

Emailed: submissions@aemc.gov.au

Dear Sir,

Congestion Management Review – Materiality of Congestion

In a letter dated 3rd of November, most of the above participants sought an extension of time for further submissions to be considered prior to the release of the Congestion Management Regime draft report later this year. This request was related in particular to the materiality of congestion and dynamic efficiency drivers.

Attached is a submission in relation to the materiality of congestion.

As stated in the earlier letter it is not adequate to assess the materiality issue solely on historical measurement of congestion or the performance of TNSPs in building transmission. The reasons for this are explained in the attached submission.

Other work in relation to the materiality of congestion and dynamic efficiency drivers is continuing and will be submitted as soon as it is available.

If you have any questions in relation to this request, please call Roger Oakley on (03)9612 2211.

Yours faithfully,

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Why intra-regional congestion is not immaterial

A supplementary submission to the
AEMC Congestion Management Review

- from -

International Power
Loy Yang Marketing Management Co
Intergen
TRUenergy
AGL Hydro
Hydro Tasmania
Flinders Power

November 2006



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Executive Summary

A recent study undertaken by MMA – and submitted to the AEMC congestion management review – reviews the performance of TNSPs in fulfilling their network development role and concludes that, to date, they have been largely successful. It argues that, so long as this level of performance continues, material levels of intra-regional congestion will be avoided.

The MMA study is a comprehensive and valuable study into the TNSPs' performance. Nevertheless, we consider that its conclusion in relation to intra-regional congestion is flawed. TNSPs are obliged to undertake network augmentation to maintain reliability standards, and may also choose to undertake other economic augmentation. Neither role directly tackles intra-regional congestion, except possibly at times of peak demand where congestion may compromise reliability. Indeed, TNSPs are *prohibited* from augmenting the network simply to relieve constraints unless such augmentation is also required to meet TNSP reliability obligations or is shown to be economic, where the value of congestion avoided exceeds the augmentation cost.

In this submission we consider how constraints may develop in a reliable network. We demonstrate, using several hypothetical examples of power systems, that a reliable network need not be constraint-free. A simple radial network serving a single major load centre will be unconstrained, but constraints will emerge as the grid becomes more complex and interconnected.

This is how the grid has developed in the NEM, beginning with weakly-interconnected, self-sufficient, State-based grids and evolving into a single, complex and strongly-interconnected grid. Our assessment would predict such an evolution to be accompanied by increasing levels of intra-regional congestion, and we cite some studies of historical data which seem to support this view.

The ultimate goal of grid development, as expressed by the MCE and COAG, is a "National Grid", in which political boundaries become irrelevant. In such a grid, electrical and political boundaries will rarely align¹, and it is inter-regional, rather than intra-regional, congestion which is likely to become immaterial or at least second-order.

We conclude that intra-regional congestion is likely to be material in the NEM and will trend upward until it reaches an economic level. This is consistent with – and an inevitable consequence of – the policy objective of achieving a reliable and economic National Grid.

This paper does not canvass or propose any particular solution for the management of material intra-regional congestion, the more general issue of how intra-regional congestion might be addressed is beyond the scope of this report. Rather we are concerned that the issue is given appropriate consideration by the AEMC, to allow the consideration and analysis of all possible solutions that would improve productive allocative or dynamic efficiency.

¹ Accept where this occurs for intrinsic and immutable reasons: for example between Victoria and Tasmania.

Introduction

In its Congestion Management Review, the AEMC is considering possible options for managing intra-regional congestion. Clearly, “do nothing” is an option that must be considered. It may actually be the AEMC’s preferred option if it is considered that the costs associated with intra-regional congestion are lower than the cost of developing and implementing new mechanisms to help manage it. Thus, the assessed current and future “materiality” of intra-regional congestion is a key input into the review.

A recent submission² to the AEMC considers this issue. Based on the findings of a study undertaken by McLennan Magasanik Associates³ (MMA), the submission concludes that:

TNSPs are committing resources to projects at the right time and in the right location to relieve significant points of intra-regional congestion. MMA expects that TNSPs will continue to make efficient investments in response to emerging constraints.

The MMA study itself concludes that⁴:

From the review of APRs over the years, it is also clear that TNSPs are anticipating emerging constraints and responding appropriately such that no material [intra-regional] congestion emerges. There are also no indications that the TNSPs will not be able to continue their maintenance of networks in the future such that there are no material and persistent network congestions.

From these statements and other similar statements in the submission, it is strongly implied that TNSPs have obligations (eg “responding appropriately...”) to ensure that no material congestion emerges and thus, so long as they continue to “respond appropriately” there will be no material congestion in the future.

This submission argues that, in fact, TNSPs have no obligations to manage intra-regional congestion, either explicit (“*de jure*”) or implicit (“*de facto*”). Thus, it should not be assumed that intra-regional congestion will remain immaterial and, conversely, the emergence of material congestion does not imply any shortcomings in a TNSP’s performance.

² Letter from Macquarie Generation to AEMC, 25th September 2006

³ Management of Intra-regional Constraints, Final Report to Macquarie Generation, MMA, September 2006, P21 (attached to the Macquarie Generation letter)

⁴ *ibid*, P2.

De Jure Considerations

Annual Planning Review

The National Electricity Rules (“the Rules”) require⁵ that TNSPs publish an annual planning report that, *inter alia*, presents:

- a forecast of *constraints* and inability to meet the *network* performance requirements
- the proposed solution to the *constraint* or inability to meet the *network* performance requirements
- other reasonable *network* and non-*network* options considered to address the actual or potential *constraint* or inability to meet *network* performance requirements

The juxtaposition of “constraint” and “network performance requirements” in these Rules is unfortunate since, as a TNSP is clearly obliged to achieve the latter, it might easily be assumed that it is also obliged to relieve the former. But this is not the case. Although a TNSP is obliged to identify constraints and options for relieving them, it is *not* obliged actually to augment the network accordingly. Indeed, on the contrary, it is prohibited from augmenting the network unless such augmentation is required to meet TNSP reliability obligations or is shown to be economic. This is discussed further below.

Reliability Obligations

A TNSP is obliged to augment its network as necessary to maintain reliability standards. These are specified in clause S5.1.2.2 of the Rules and also in different jurisdictional planning standards applying in each State. Without going into a detailed examination of these requirements, it is generally accepted that these are:

- § in NSW and Queensland, the requirement to ensure that, with all assets except for planned outages in service, all demand can be securely supplied: ie a deterministic n-1 planning standard;
- § in Victoria, the requirement to ensure that levels of unserved energy (USE) are economic, when valued at a specified “value of customer reliability” (VCR): typically around \$30,000/MWh: ie a “probabilistic” planning standard;
- § in Tasmania, a mix of deterministic and probabilistic standards; and
- § in South Australia, various deterministic planning standards (eg N-1, N-2 etc) on different parts of the network

More important is what these reliability standards do *not* say. They do not require that in-merit generation⁶ is always able to be fully dispatched. It is quite permissible for some generation to be constrained *off*⁷ so long as there is other spare generation capacity

⁵ Clause 5.6.2A

⁶ generation with an offer price below the local Regional Reference Price (RRP)

⁷ generation *not* dispatched that *would* be dispatched but for intra-regional constraints

available to be constrained *on*⁸ so that demand can continue to be supplied securely (deterministic standard) or with high probability⁹ (probabilistic standard).

In short, reliability standards do not explicitly require that material intra-regional constraints are relieved through augmentation. Put another way, their focus is delivery reliability; the standards do not specify transmission reliability for injection or transfer of electricity into the grid¹⁰.

Economic Augmentation

Where reliability is not a concern, a TNSP may still augment – indeed may only augment – if the augmentation can be demonstrated to be economic: ie if the amount by which the augmentation causes future congestion costs to be reduced exceeds the cost of the augmentation¹¹. The TNSP must also demonstrate that the timing of any economic augmentation is optimal in the sense that the net benefit is maximised.

This implies that some material level of congestion will be tolerated before any augmentation becomes economic. Specifically (based on an NPV calculation), the expected annual congestion must be greater than the annual return on capital of the augmentation needed to relieve the congestion¹². So, for example, if the relevant discount rate were 10% and the augmentation capital cost were \$50m, annual congestion costs of up to \$5m would be tolerated before the augmentation would be justified.

In summary, the process of economic augmentation does not imply that all material intra-regional congestion will be relieved. On the contrary, it implies some material level of intra-regional congestion will be tolerated without triggering augmentation.

Summary

The provisions of the Rules, jurisdictional reliability standards and the Regulatory Test do not create an explicit *de jure* obligation or incentive on TNSPs to augment their networks to ensure that all material intra-regional congestion is removed.

⁸ generation dispatched that would *not* be dispatched but for intra-regional constraints

⁹ Augmenting to maintain a probabilistic reliability standard is really just a special case of economic augmentation, discussed in the next section, so the analysis in that section generally applies. Note, however, that TNSPs are obliged to undertake such reliability-driven augmentation whereas other economic augmentation is voluntary.

¹⁰ This point has been acknowledged in recent jurisdictional consultations, such as the review of planning standards in South Australia - refer to the *Review of Reliability Standards Specified in Clause 2.2.2 of the Electricity Transmission Code: Draft Decision*, ESCOSA, June 2006 (pp27-28). ESCOSA specifically identified this as a wider issue to be addressed in reviews such as the AEMC's Congestion Management Review.

¹¹ The TNSP may also take into account any "competition benefits" that accrue from more efficient wholesale energy prices as a result of the augmentation. However, these are unlikely to be material in relation to intra-regional augmentation

¹² bringing forward an augmentation by one year creates an additional cost equal to the annual return on capital and allows one year of congestion costs to be avoided

De Facto Considerations

Impact of De Jure Requirements on Congestion

Notwithstanding the *de jure* considerations, it may be the case that, by responding to their *de jure* obligations and incentives (in relation to reliability or economic augmentations), TNSPs have the *de facto* effect of removing all material intra-regional congestion. It is certainly the case that economic augmentation should maintain intra-regional congestion costs at or below some economic level and reliability considerations are likely to ensure that congestion costs are lower still. The question is whether the congestion costs are likely to be so low as to be immaterial¹³. In this section, arguments and examples are presented to demonstrate that this is unlikely to be the case.

Six simple, stylised examples of power systems are described and discussed below. In each case, reliability standards are maintained but (save for the first example) some intra-regional congestion will occur. For simplicity of illustration, the examples below are designed to achieve an N-0 reliability standard. However, in each case they could be adjusted to achieve N-1 reliability without altering the overall conclusions¹⁴.

¹³ neither Macquarie Generation nor MMA have defined what they mean by “material”. In the context of the AEMC review, we take it to mean the level at which it is worthwhile implementing additional congestion management mechanisms

¹⁴ For example, the transmission capacity of a single, radial line between two points based on an N-0 standard could be generalized to become the *secure* transmission capacity of a meshed network between those same two points using an N-1 standard.

Example 1: Simple Isolated Region

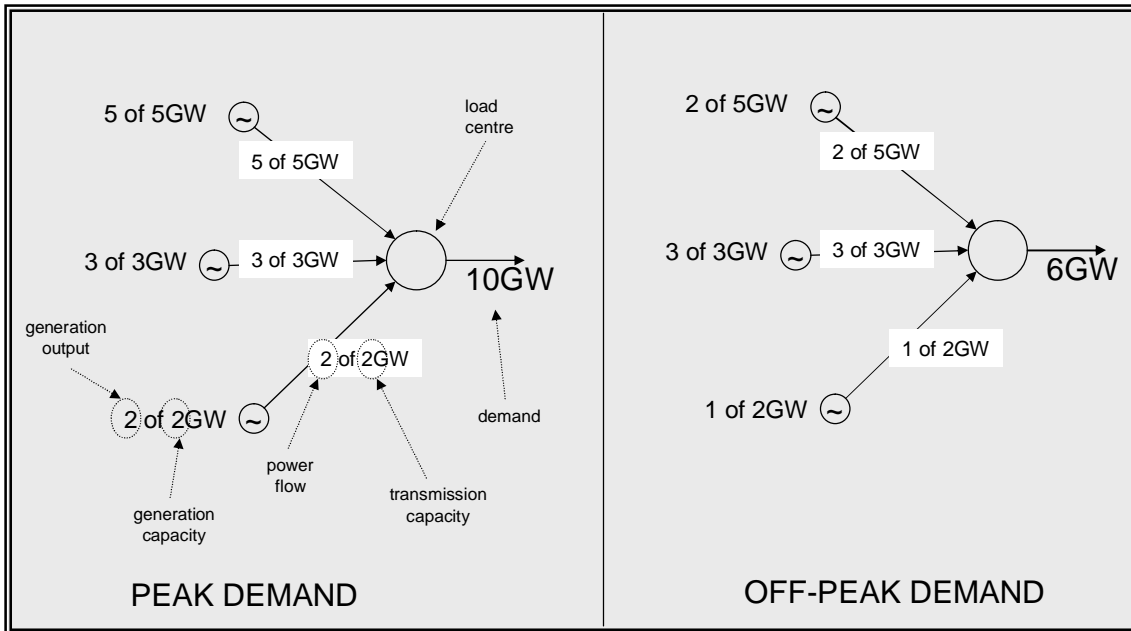


Figure 1: Simple Isolated Region

Figure 1 above shows a simple example of a single demand location being supplied by a radial network. If the generation market is in long-run equilibrium, there should be just sufficient generation to reliably supply peak demand. Thus, to meet reliability standards, the TNSP must ensure that there is sufficient transmission capacity to transport all of the generation capacity. In doing so, it will eliminate all intra-regional constraints¹⁵. In this simple example, therefore, meeting reliability standards is synonymous with removing intra-regional constraints.

¹⁵ Except during planned outages, as discussed in Example 6

Example 2: Isolated Region with distributed Demand

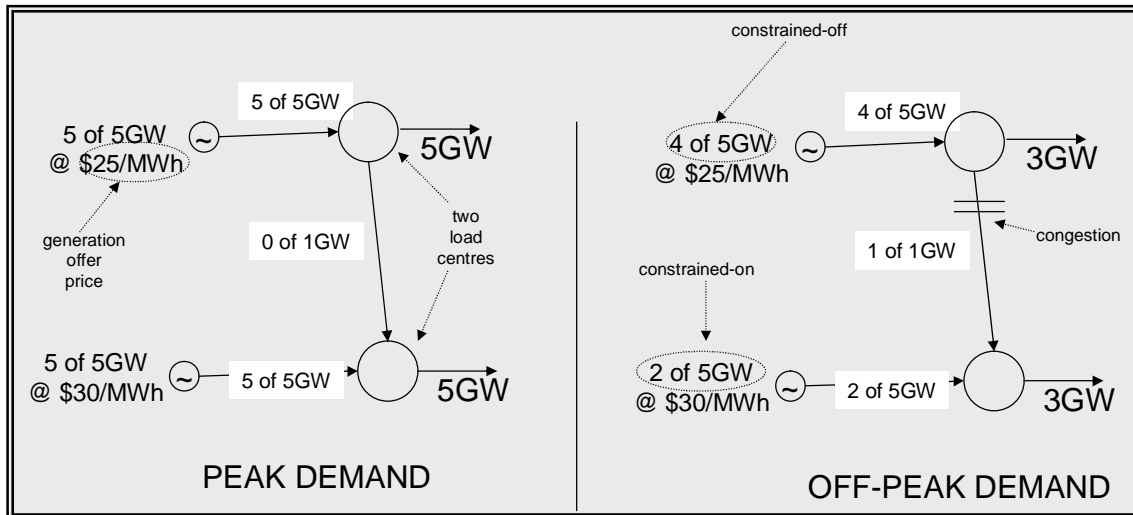


Figure 2: Isolated Region with Distributed Demand

A slightly more complicated example is shown in Figure 2 above. In this case, there are two demand centres, each with local generation sufficient to supply the local demand. In this respect, reliability standards would be met even without any interconnection between the two demand centres. However, the example assumes some economic level of interconnection has been made.

Nevertheless, away from the demand peak, it may not be possible to dispatch the cheaper generation at full output due to transmission constraints. As noted previously, economic augmentation will not entirely remove these constraints. Thus, even in this very simple example, material intra-regional congestion will occur.

Example 3: Interconnected Regions

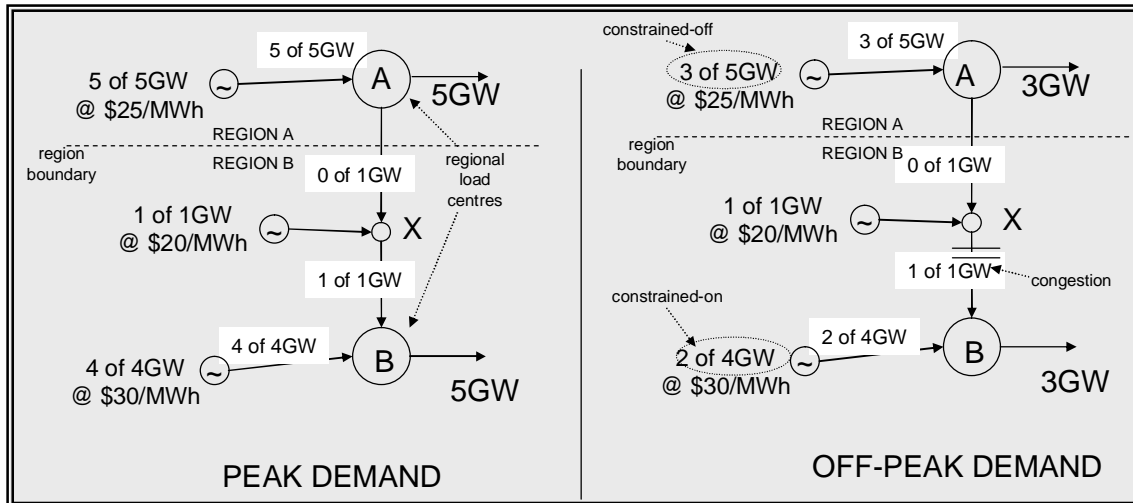


Figure 3: Interconnected Regions

The previous example can be varied to place the two demand centres in separate regions, each of which are self-sufficient at peak (hence there is no *reliability* requirement to interconnect the two regions), as shown in Figure 3. Away from peak, the cheaper generation in region A should be dispatched to displace more expensive generation in region B. However, inadequate transmission capacity causes region A generation to be constrained-off. The example has been adapted slightly to make clear that the congestion is intra-regional, not *inter*-regional.

In this example, it may appear that the interconnector from A to X has limited economic value and would not be built. Or, alternatively that, if it had economic value, then expanding the line from X to B would be similarly economic and the constraint would be relieved. However, the interconnector may have been justified by the value of reserve sharing, or may have been built when region A had surplus generation and B had a shortfall; the generator at X may have arrived later.

Example 4: Tidal Flows between three regions

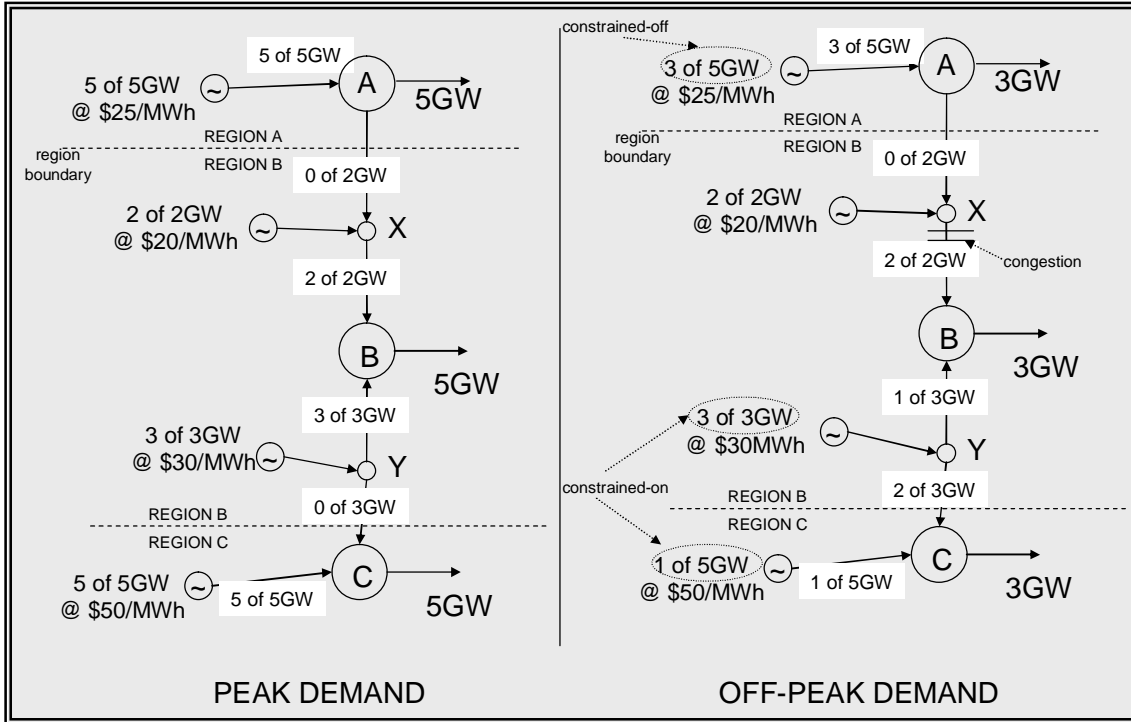


Figure 4: Interconnected Regions with Tidal Flow

A further elaboration of the previous example, now with three regions, is shown in Figure 4. In this case, dispatch economics would suggest that the cheaper generation available from region A should “wheel” through region B to displace the dearer generation in region C. However, the ability to do this may be restricted by constraints in region B: in this example between A and X. Since the region B network is sufficient to supply region B demand, there is no reliability-driven imperative to augment. Augmentation would only occur when economic.

Depending upon the demand pattern and generation mix in each region, it may be possible for the tidal flow to reverse at other times.¹⁶ In this case, intra-regional congestion could occur between Y and B. Since congestion is now taking place in two different places – at different times – it may become even more material before economic augmentation is justified¹⁷.

¹⁶ of course, for this to happen, the prices of marginal generation in each state would need to change from those shown.

¹⁷ For example, suppose the annual costs of capital to build out the constraints between A and X and between Y and B were \$10m and \$20m, respectively. Then annual congestion could reach \$30m in aggregate before economic augmentation took place.

Example 5: Loop Flow Effects

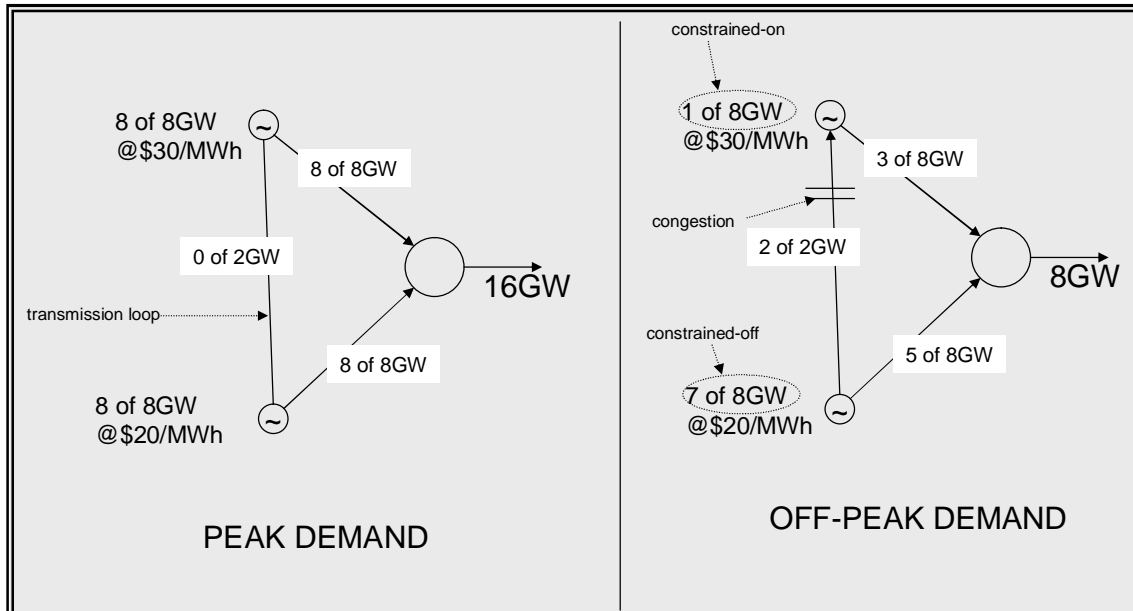


Figure 5: Single region with Loop Flows

Figure 5 above introduces a simple network loop: a triangle with generation at two corners and demand at the third corner¹⁸. At peak demand, with both generators at full load, loop flow effects are minimised and no constraints arise. However, away from peak, it is not possible to dispatch only the cheaper generation as loop flows would then overload the line between the two generators.

It would be complex, but not impossible, to develop an equivalent example of loop flow congestion occurring under N-1 planning standards.

¹⁸ for simplicity the three lines are assumed to have equal impedance

Example 6: Planned Outages

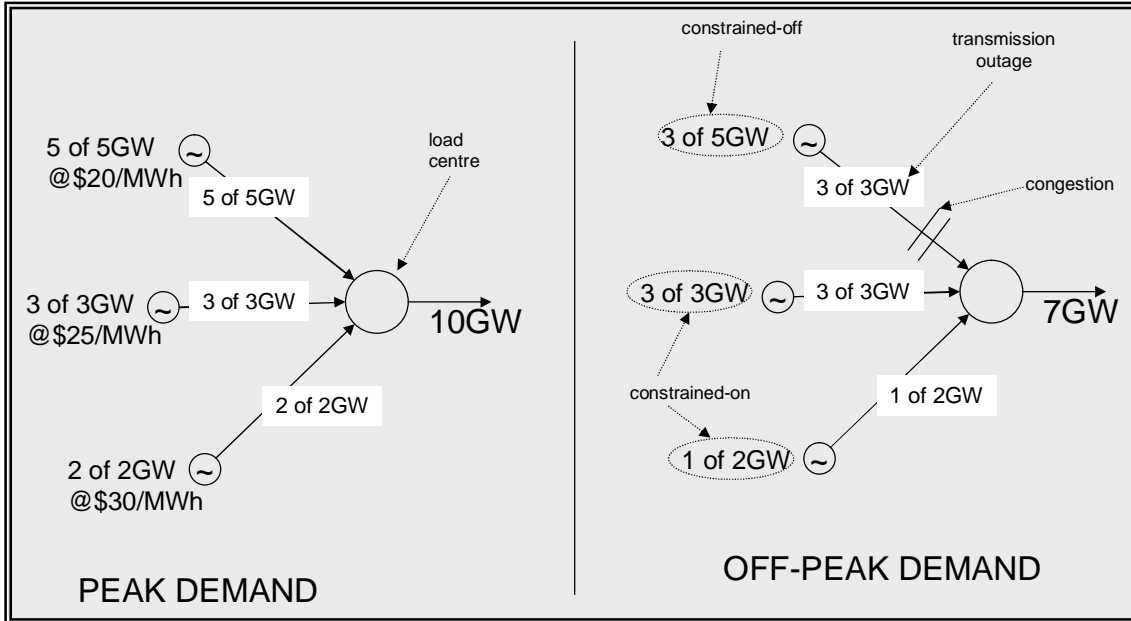


Figure 6: single region with planned outages

Figure 6 shows how planned outages in the simple isolated region example can lead to temporary congestion. Admittedly, such constraints are not “enduring” but they may nevertheless be material, particular when many occurrences of such congestion are aggregated.

Summary

The simple examples in this section have illustrated how intra-regional congestion may arise under a number of circumstances and network topologies when, nevertheless, reliability standards continue to be met. Thus, there is no *de facto* equivalence between network reliability and low levels of intra-regional congestion.

The examples also suggest that the more complex and interconnected the power system, the greater the opportunities for intra-regional congestion to occur.

Congestion in the NEM

Lessons from the Simple Examples

The examples in the previous section are hypothetical and highly-stylised. It is not clear to what extent they might occur in the real-world or, if they did occur, how material the resulting congestion would be. To answer these questions would require substantial numerical modelling which is beyond the scope of this submission.

However, the examples do suggest that intra-regional congestion may be low where regions are largely radial and self-reliant. This was, of course, the situation pre-NEM. In the light of this, perhaps it is not too surprising that intra-regional congestion was not material in the early days of the NEM. However, as the NEM develops and increasingly resembles the more complex examples above, we may expect intra-regional congestion to become more material. This is occurring even now at critical points such as Snowy¹⁹ and may be expected to become more widespread over time.

The MMA Methodology

MMA describe their methodology²⁰ as follows:

To assess how the TNSPs manage intra-regional constraints, the main intra-regional constraints for each NEM region were studied from 2001 to 2006. The issues that were used to analyse how these constraints were managed were based upon the following questions:

- § Did the justification for the project based on reliability or wider market benefits remain consistent during the review period?
- § Was the constraint identified outside the lead time required for the most efficient option to be implemented?
- § Did the determining factor of timing remain consistent over the period?
- § Was the project committed in sufficient time to meet the service requirements?
- § Did the estimated cost remain stable as the planning and design work was refined?
- § Did the project pass the regulatory test on first application?

If the analysis shows that the answer to these questions are generally affirmative, then it can be ascertained that the intra-regional constraints are being managed in a timely and efficient manner such that TNSPs are anticipating emerging congestion and **responding in such a way that no material congestion emerges**. [our emphasis]

In short, MMA argues that, if TNSPs perform well at maintaining reliability standards and at undertaking economic augmentations, then congestion will remain immaterial. This would be true if such TNSP performance had a *de jure* or *de facto* connection to congestion materiality. As we have seen, this is not the case.

In the light of this, we do not share MMA's confidence in predicting that congestion is and will remain immaterial. We note that MMA have undertaken no modelling to directly support their view: there is no examination of congestion costs and the only market outcomes they present relate to network reliability. MMA have undertaken an excellent

¹⁹ A "wheeling region" with little indigenous load and so no reliability-driven augmentation – except in relation to the NSW jurisdictional requirements

²⁰ P4 of the MMA report

study into whether TNSPs are effective at developing their networks, but have not satisfactorily addressed or answered the question of congestion materiality.

Other Studies of intra-regional congestion

There are a number of other studies which address the question of congestion materiality.

IES²¹ analysed historical data on the number of constraints in the NEM and how often they bound. They concluded that:

Presently, there is a large number of system security constraints²² in the NEM with many new constraints added each month... [This] suggests that it will be difficult to set up an effective congestion management regime that focuses only on a small proportion of constraints. In fact, it would probably be more satisfactory in many ways to have all security constraints incorporated into a congestion management regime.

Darryl Biggar²³, a consultant to the AEMC on the Congestion Management Review, has also analysed historical data, in this case to assess how often individual generator nodes are affected by intra-regional congestion. He concluded that:

Mis-pricing is a frequent and enduring issue at a relatively large number of [generator] connection points...The number of mis-priced connection points and the average number of hours of mis-pricing per connection point has been increasing quite rapidly over the past three years²⁴.

The AER²⁵ has also analysed historical data to estimate the impact of congestion (inter- and intra-regional) as part of the development of market-based operational incentives for TNSPs. It concluded that “significant” intra-regional congestion occurred in 2004-5 in the following locations:

- in central Queensland, constraining on Gladstone and Stanwell and constraining off Callide B and C, for around 190 hours
- in far north Queensland, constraining off Yabulu, for around 70 hours
- between central Queensland and Brisbane load centre; for around 44 hours
- around Boyne Island (in central Queensland) constraining on Gladstone for around 39 hours
- in the Latrobe Valley (in eastern Victoria) constraining local generation for more than 100 hours;
- between Liddell and Newcastle (in northern NSW) for around 94 hours

²¹ IES Submission to the Congestion Management Review, April 2006

²² inter-regional and intra-regional

²³ Congestion Management Issues: How significant is the mis-pricing impact of intra-regional congestion in the NEM, October 2006

²⁴ We quote this finding because such “mis-pricing” indicates the presence of material intra-regional congestion and not because we necessarily support the author’s views on how such mispricing could or should be corrected. Indeed, the more general issue of how intra-regional congestion might be addressed is beyond the scope of this report.

²⁵ Indicators of the market impact of transmission congestion, Report for 2004–05, October 2006

- between Sydney West and Regentville, affecting dispatch for around 14 hours
- along the western Sydney transmission ring, affecting dispatch for 41 hours

The list above includes only the intra-regional constraints which are “internal to a single region”. The analysis also identified many hybrid constraints – intra-regional constraints affecting inter-regional flows – such as those in northern NSW affecting flows on QNI. The analysis estimated that the total cost of constraints (inter- and intra-regional) was \$45m for the 2004-05 year²⁶ up from \$36m in the previous year. It is widely expected that the total cost of constraints for 2005-06 will be higher still.

Costs of Congestion for Market Participants

It should be borne in mind that the congestion estimates discussed above are measures of *realised* congestion. These figures do not and cannot estimate the indirect impacts of congestion on market participants arising from the risks of potential congestion. The volatile and disparate nature of intra-regional congestion – as revealed in the AER report for example - makes these risks high and difficult to manage.

Summary

Our hypothetical analysis suggests that intra-regional congestion in the NEM is likely to trend higher over time as the grid evolves. Some empirical studies seem to support this view. Since MMA have mistakenly relied on TNSP performance as a prime indicator and driver of congestion relief, we think that their conclusion on congestion materiality is flawed.

²⁶ Indicators of the market impact of transmission congestion, Report for 2004–05, October 2006

Congestion in a National Grid

The MCE and COAG²⁷ have established a policy objective of achieving a “full national transmission grid”. It is worth considering what such a grid might look like.

Our interpretation would be that, under such a vision, jurisdictional boundaries would become irrelevant. Augmentation would continue to take place based on economic and reliability considerations, but State boundaries would not be a factor. Thus, for example, Transgrid in choosing the lowest cost option to maintain reliability standards, may arrange for augmentation to take place in Queensland (say) or across the Queensland-NSW border, if this were cheaper than any alternative within the borders of NSW²⁸. In modelling future reliability, a TNSP would be obliged to consider the entire NEM system, not just its own State, plus notional interconnector support.

This is not to say that regional pricing boundaries are necessarily changed or removed. In any case, the augmentation process is only loosely related to regional boundaries²⁹. Neither is it to say that a single reliability standard must apply across the NEM. In fact, South Australia already has different standards in different parts of the State.

Over the longer-term (as the legacy of State-based grids fades) where would material congestion occur in such a national grid? If constraint boundaries happened to align exactly with political boundaries, it would either be coincidental or, in a few limited cases³⁰ reflect constraint boundaries aligning naturally with political ones. To take an analogy, major constraints on the England and Wales grid (which has long operated as a “national” grid) rarely if ever align with the Wales-England border.

Thus, in such a grid, the vast majority of congestion will be intra-regional. Only occasionally will the “stars align” to create a true inter-regional constraint. So, unless augmentation objectives are changed so that *all* material congestion is explicitly targeted and removed³¹, intra-regional congestion should become increasingly material over time.

Conversely, if the framing of existing reliability standards and TNSP obligations is such that most material congestion will occur at state boundaries over the long term, the rules must be inconsistent and incompatible with the vision of a national grid. Steps have already been taken to redress such an intra-regional “bias”. For example, the ANTS process helps to promote inter-TNSP co-operation in developing inter-regional augmentation. In doing this, it is likely to reduce inter-regional congestion and at the

²⁷ through the ERIG process

²⁸ indeed, it is not entirely clear whether they are obliged to do this presently. Although clause S5.1.2.2 is titled “network service within a region” nothing in it appears to preclude taking account of network capacity and constraints outside the region. Indeed, TNSPs currently make some allowance for inter-regional flows when assessing whether reliability standards are met.

²⁹ The Rules are unclear about the status of States and regions in the context of augmentation. For example, clause S5.1.2.2 is titled “network services within a *region*”. However, jurisdictional planning standards apply across individual States, irrespective of region boundaries. The Regulatory Test makes no reference to regions and only refers to jurisdictions in relation to reliability standards.

³⁰ in fact, the Tasmania-Victoria boundary is the only one we can think of

³¹ the “aluminium sheet” option which, of course, we do not support and which is inconsistent with the NEM objective

same time (as shown in the examples) create new situations where intra-regional congestion may occur.

In summary, economic levels of congestion in a truly national grid should occur both intra-regionally and inter-regionally. Over time, intra-regional congestion should increase and inter-regional congestion should decrease, until the latter occurs only by coincidence where electrical and political boundaries happen to coincide.

In its recent Annual National Transmission Statement³², NEMMCO estimated the present value of all congestion in the NEM (from 2009/10 onwards) at \$2.2bn. Of course, some of this can be removed through economic augmentation and much of it will be inter-regional. Nevertheless, in the context of a National Grid, with congestion increasingly being intra-regional, it is difficult to envisage how intra-regional congestion could become and remain immaterial.

³² Statement of Opportunities 2006, Executive Briefing, P19

Conclusions

The provisions of the Rules and the Regulatory Test require TNSPs to maintain reliability of supply to transmission customers and encourage them to maintain congestion costs at an economic level. However, they have no obligation or incentive to maintain congestion at a level which is “immaterial” in the context of the congestion management review. Indeed they are prohibited from undertaking augmentation that is not required for reliability or economic reasons.

Based on assessment of some hypothetical examples presented in this submission and examples of empirical analysis undertaken elsewhere, we would expect intra-regional congestion to trend higher, starting from a low base at the start of the NEM (reflecting the legacy of State-based power systems) and eventually reaching some economic level, taking into account the cost of the transmission augmentation needed to relieve congestion. This eventual level will certainly be “material”. Indeed, the empirical evidence suggests that congestion is already material.

With the COAG and MCE objective of a “National Grid”, State and regional boundaries should become increasingly irrelevant to where congestion occurs. Thus, over the longer term, inter-regional congestion should occur quite rarely, when electrical and political boundaries happen to align. This means that the majority of congestion will occur intra-regionally. Conversely, a continuing low level of intra-regional congestion would be a strong indication that the objective of a National Grid has failed to be achieved.

This paper does not canvass or propose any particular solution for the management of material intra-regional congestion, the more general issue of how intra-regional congestion might be addressed is beyond the scope of this report. Rather we are concerned that the issue is given appropriate consideration by the AEMC, to allow the consideration and analysis of all possible solutions that would improve, productive allocative or dynamic efficiency